if the ϕ ratio be that of "perfect growth," it is one towards which vital architecture *tends* rather than one which it reaches. Even the Nautilus shell is only an approximation to it, and this to Mr. Cook is half the charm. For the approximateness reveals the *endeavour*, which arouses our sympathy, while mathematical exactness leaves us dull. Life is like an artist, full of individual variability. "Perfect beauty, like natural growth, implies irregular and subtle variations."

But the ϕ proportion is not only a descriptive formula for natural growth, it shows itself in statues and in the proportions of pictures. It looks as if the secret of one type of successful growth (of course, there are other non-spiral architectural creations) echoed in the artist's expression of the beautiful, and even in our appreciation of it. Perhaps the logarithmic spiral with the Pheidias ratio is an "objective" element in beauty, not merely in the sense that mankind was literally brought up on spirals—in days when spiral phyllotaxis was a problem by no means academic, when the coils of the succulent bulb and the toothsome whelk had an interest much more than æsthetic, when the spiral conch called the tribe to war—and when, for we need not expatiate, the spiral mode of growth became the Swastika symbol of good growth and good luck. We should be inclined to press the point that spiral architecture became prevalent in the evolution of organisms because it was, for certain conditions, particularly fit. It was a successful architectural style, discovered among the unicellulars, and always kept, with the sublime conservatism of vital evolution, *available*, for whatever experiment in internal structure or external form might be demanded or prompted by the exigencies of the situation. The secret was much too good to lose. But Man is conservative as well as Nature, and he began to accumulate pleasant feelings in association with all manner of spirals. But Mr. Cook will not be content with any position of this sort. "If ϕ in some way describes the principle of growth, which is one revelation of the spirit of Nature, would not the artist most in touch with Nature tend to employ that proportion in his work, even though he was not conscious of its exisence?" We confess to wishing to work for a while longer with the hypothesis that the artist uses the ratio of Pheidias because it figures largely in Nature, and thus in Man's upbringing. But Mr. Cook's view is subtler, that Leonardo and the Nautilus exhibited a dominance of the ϕ spiral in their respective masterpieces because they were both artists. We like the spiral shell, and still more the spiral staircase of Blois, not merely because impressionable mankind was brought up on spirals, but because the spiral in question represents one of the inmost experiences of life itself—an endeavour after perfect growth. This seems to be Mr. Cook's view, but we are sceptical.

Mr. Cook has given us a delightful study, eloquent of patience in collecting examples of spirals, of delight in measuring them by the Pheidias rule, and of quiet meditation over "the unspent beauty of surprise" and the worldwide treasures of significant form. The personal note is strong and it is pleasant, but we have sometimes wished, as we read the book, that the author had been more methodical, and less swift to move from one problem to another. For there are many problems. (1) There is the question, which Mr. Cook has in part answered, as to the various architectural types—spiral and otherwise—exhibited by organisms—a question to which Haeckel paid considerable attention long ago in his discussion of "promorphology." (2) There is the question of the varied utility of the spiral, which gives it its survival-value. To answering this Mr. Cook has made some contribution. (3) There is the difficult problem of the forces at work in the genesis of the spiral form, of the physical forces or the properties of matter that determine shape. A preliminary (as it were, aeroplane) survey of this borderland between morphology and physics will be found in Prof. D'Arcy Thompson's brilliant presidential address to Section D of the British Association in 1911; and a paper by the same naturalist on the shapes of eggs (NATURE, vol. lxxviii., pp. 111, 158) is also important. (4) There is the question of the recurrence of the logarithmic spiral in human works of art. Nor should we forget the spider's spiral, the making of which is to be ranked beside building nests and shaping honeycomb, not beside the secretion and moulding of shells. (5) Then there is the problem of why these spirals please us, and are joys for ever. In regard to which it should be carefully noted that there are (*a*) physiological, (*b*) intellectual, and (*c*) imaginative or sympathetic factors in our appreciation of beauty. (*a*) There are shapes that sing, and produce pleasant eurhythmic echoes in our bodies. (*b*) There are shapes which arouse happy associations, and others of which the adaptiveness never fails to please. (*c*) There are others, again, which strike a deeper note, in which we recognise a triumph of life over its materials and difficulties. It is in the contemplation of these achievements that the artist in us is thrilled most deeply, sharing a vicarious triumph.

ICEBERG OBSERVATIONS.[1]

AFTER the loss of the *Titanic* in April, 1912, had directed attention to the dangers from ice in the North Atlantic, the Government and the shipowners concerned chartered the *Scotia* as an experimental ice-observation vessel to cruise to the north of the trade routes. The *Scotia*, fitted with wireless and carrying three investigators and two Marconi operators, was commanded by Captain T. Robertson, her former captain in Bruce's Antarctic expedition. Her work was carried on from March to August, 1913, and proved so useful that the year following she was replaced by a specially-built ice-patrol boat of larger size, and so perhaps more suitable for the work, though it would be

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[1] "Ice Observation, Meteorology and Oceanography in the North Atlantic Ocean." Report of the work carried out by the s.s. *Scotia*, 1913. Text, pp. 142. Price 4*s*. 6*d*. Map and Charts. Price 2*s*. 6*d*. (H.M.S.O., 1914.)

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difficult to construct a stronger, handier, and better ice-boat than the *Scotia*.

The most generally interesting parts of the detailed reports in this volume are those relating to the detection of icebergs by temperature observations. A Callendar self-recording electrical resistance thermometer held at a depth of 2 ft. below the surface failed to indicate any effect of icebergs on the temperature of the sea. In most cases the passage of the *Scotia* by an iceberg did not correspond with any hump or depression in the temperature curve, and when it did it was impossible to distinguish these from the ordinary variations in the temperature of the sea. As this thermometer, which indicated trustworthily variations of 1/10°, was unaffected by passing icebergs it would be useless in practice to employ such a method of detection. In fact, any variation unrecognisable by an ordinary thermometer would be valueless to the seaman. In his investigation on the *Montcalm* Prof. Barnes came to the conclusion that the real effect of an iceberg on the surrounding water is to warm it slightly. Mr. G. I. Taylor found indications of this, but the effect could not be utilised to detect the presence of bergs on the Newfoundland Banks because the temperature of the sea in that region undergoes small rises in places independent of icebergs. Prof. Barnes found his striking indications of these rises of temperature near inshore, but the *Scotia*, on the other hand, was at work hundreds of miles off the land. It cannot have been that the electrical thermometer of the *Scotia* failed to detect these changes, since check temperatures taken in bucket samples with a thermometer reading to 1/20° gave little or no such indication.

Nor did Mr. D. J. Matthews, the oceanographer on board, find any relation between icebergs and sea temperature. He noticed no rise in temperature in the vicinity of ice, but, on the other hand, found sudden changes in many parts of the North Atlantic where there certainly was no ice within 500 miles.

Similar changes in temperature in the sea far removed from icebergs were noted by the patrol of the U.S.SS. *Chester* and *Birmingham* in 1912.

In fact, all that a sudden fall in surface temperature means is that the ship has entered the polar current and may meet ice if there is any in the neighbourhood. A rise in temperature shows that the chances of ice are less, but not that the ship is safe.

Therefore, unless wireless warnings of the extent of the pack and the position of bergs can be satisfactorily circulated, which is doubtful, ships will have to rely on a careful watch from near the water-line, and the development on the part of the look-out or ice-pilot of that extra sense which all polar navigators gain in time that enables them, as they say, to "smell" the presence of ice. The report ends with a lengthy study of the plankton distribution by Mr. L. R. Crawshay, who reached results similar to those of the physical observers on ice-bearing currents.

R. N. R. B.

LIEUT.-COL. D. D. CUNNINGHAM, F.R.S.

WE recorded last week, with much regret, the death on December 31, in his seventy-second year, at his residence, Tormount, Torquay, of Lieut.-Col. D. D. Cunningham, formerly of the Indian Medical Service.

D. D. Cunningham was born at Prestonpans on September 29, 1843, and was the son of the Rev. W. B. Cunningham, one of the most scholarly of the clergymen who left the Church of Scotland at the Disruption of that year. After leaving school young Cunningham entered the University of Edinburgh, where he graduated with honours in the Faculty of Medicine in 1867. Early in 1868 he joined the Indian Medical Service, and at the Army Medical School, Netley, he took a position as distinguished as that which he had attained in his university.

While Cunningham was at Netley the attention of pathologists in this country was directed to the theories regarding the causation of cholera advanced by Hallier and De Bary, and at the instance of the teaching staff of the Army Medical School the Secretaries of State for War and for India resolved to depute the two young officers who should secure the highest places in the Queen's and the Indian Medical services respectively to learn at first hand the nature and bearing of the theories. Cunningham was the young Indian surgeon thus chosen; the officer of the British Medical Service selected was T. R. Lewis, a man of the same academic standing as Cunningham, but a few years his senior in age, who had graduated with honours in medicine, also in 1867, in the sister university of Aberdeen.

As a result of this selection Cunningham spent some time as an inmate of the house of the Rev. M. J. Berkeley, F.R.S., and acquired a knowledge of the technique employed by that distinguished mycologist. In company with Lewis he paid visits to Hallier and to De Bary, proceeding thereafter to Munich to study under the celebrated Pettenkofer, with whom both young men contracted ties of close personal friendship, which subsisted in the case of Lewis until the latter died, and in the case of Cunningham until the close of Pettenkofer's career.

After this period of study in Germany Lewis and Cunningham left for India, where they arrived in 1869. Immediately on landing both officers were attached for special duty to the department of the Sanitary Commissioner with the Government of India, and commenced partly in collaboration, partly independently, the series of pathological studies the excellence of which led to the selection of Lewis for the Fellowship of the Royal Society, at the age of forty-five, in 1886, and to the election of Cunningham to the Society, at about the same age, in 1889. This period of activity continued for eleven years with the happiest results, and the eloquent testimony borne to Lewis's share in their work, in the pages of NATURE for May 27, 1886, on the occasion of the untimely death of that distinguished pathologist, will better enable workers of the present

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